MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023

PMT0301 – MATHEMATICS III

(For Foundation students only)

07 JULY 2023
9.00 a.m - 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 2 pages with 6 questions excluding the cover page and formula list.

2. Answer **ALL** questions. All necessary working steps must be shown.

3. Please write all your answers in the answer booklet provided.

QUESTION 1 [7 MARKS]

a) Given $(x+2)$ *and* $(2x-11)$ are two consecutive terms of a geometric sequence with a common ratio of $\frac{1}{3}$.

i. Find the value of x.

ii. Find the first term if $(x+2)$ is the 10^{th} term of the sequence.

[4 marks]

b) The 10^{th} term of an arithmetic sequence is -41 and the sum of the first 10 terms of the sequence is -95. Find the first term and the common difference. [3 marks]

QUESTION 2 [8 MARKS]

a) Let $A = \begin{pmatrix} 2 & -1 & -2 \\ -1 & 1 & 0 \\ -2 & 1 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 1 & 2 \\ 3 & 2 & 2 \\ 1 & 0 & 1 \end{pmatrix}$.

i. Find AB. [1 mark]

ii. Hence, or otherwise, solve the following system of linear equations.

$$\begin{aligned} 3x + y + 2z &= 11 \\ 3x + 2y + 2z &= 10 \\ x + z &= 5 \end{aligned}$$

[2 marks]

b) Using Gauss-Jordan Elimination, find the solution to the following system of linear equations.

$$\begin{aligned} x + 4y + 3z &= 5 \\ 4x + 8y + 3z &= 2 \\ 3x + 5y + z &= -3 \end{aligned}$$

[5 marks]

QUESTION 3 [7 MARKS]

a) Determine whether the statement is true or false. [1 mark]

No.	Statements	Answer (True/ False)
a	Two lines parallel to a third line are parallel.	
b	Two planes perpendicular to a third plane are parallel.	

b) Given the vectors $\mathbf{u} = \mathbf{j} - 2\mathbf{k}$ and $\mathbf{v} = 5\mathbf{i} - \mathbf{j} + 2\mathbf{k}$. Find the angle formed between the two vectors $\mathbf{u}$ and $\mathbf{v}$. [2.5 marks]

c) Find the parametric equation for a line passing through $(1,2,-1)$ and orthogonal to both $\mathbf{j} - \mathbf{k}$ and $2\mathbf{i} + \mathbf{k}$. [3.5 marks]

QUESTION 4 [8 MARKS]

a) A sample of 10 students in PMT0301 subject showed the following credit hours taken during first year of their Foundation program.

17, 18, 21, 18, 20, 19, 22, 21, 18, 24

i. Calculate the mean, median and mode for their credit hours. [3 marks]

ii. Find the range and standard deviation based on above data. [2 marks]

b) The frequency table below shows the record of the highest temperatures for each of the 60 cities over a period of time. Represent the data with a histogram. Hence, draw a frequency polygon on the same graph. [3 marks]

Temperature (C)	Frequency
27.1 – 28.0	2
28.1 – 29.0	9
29.1 – 30.0	8
30.1 – 31.0	11
31.1 – 32.0	17
32.1 – 33.0	13

QUESTION 5 [10 MARKS]

a) A multiple-choice test consists of 6 questions, each with 4 possible answers of which only 1 answer is correct.

i. In how many ways can a student answer the test? [2 marks]

ii. Find the probability that a student only gets 1 correct answer in the test? (You must write your final answer to 2 decimal places). [3 marks]

b) Company A has 150 employees, and the table below shows the classification of their gender and position.

	Manager	Engineer	Clerk
Male	20	37	14
Female	25	42	12

If an employee is randomly selected from company A, find the probability that

i. The employee is a male. [1 mark]

ii. The employee is a female clerk. [1 mark]

iii. The employee is a male; given that he is a manager. [1 mark]

iv. The employee is an engineer or a female. [2 marks]

QUESTION 6 [10 MARKS]

a) If the sum of the mean and the variance of binomial distribution of 5 trials is 4.8, find the probability distribution. [5 marks]

b) Suppose a book of 585 pages contains 43 typographical errors. If these errors are randomly distributed throughout the book, what is the probability that 10 pages, selected at random, will be free from errors? [5 marks]

FORMULA

$$\mathbf{u}\cdot\mathbf{v}=|\mathbf{u}||\mathbf{v}|\cos\theta \qquad |\mathbf{u}\times\mathbf{v}|=|\mathbf{u}||\mathbf{v}|\sin\theta$$

$$A^{-1}=\frac{1}{|A|}C^T = A^{-1}=\frac{1}{|A|}\text{adj } A$$

$$\mu=\frac{\sum x}{N} \; ; \qquad \bar{x}=\frac{\Sigma x}{n} \; or \; \frac{\Sigma mf}{n}$$

$$s^2=\frac{\sum x^2-\frac{(\sum x)^2}{n}}{n-1} \; or \; \frac{\sum m^2 f-\frac{(\sum mf)^2}{n}}{n-1}$$

$$a_n=a+(n-1)d \qquad S_n=\frac{n}{2}\left[2a+(n-1)d\right]$$

$$a_n=ar^{n-1} \qquad S_n=\frac{a(1-r^n)}{1-r}$$

$${}^nP_r=\frac{n!}{(n-r)!} \qquad {}^nC_r=\frac{n!}{(n-r)!r!}$$

Additive Rule : $P(A\cup B)=P(A)+P(B)-P(A\cap B)$

Complementary Events : $P(A)+P(A')=1$

Conditional Probability : $P(B/A)=\frac{P(A\cap B)}{P(A)} \quad , \quad P(A)>0$

Multiplicative Rule : $P(A\cap B)=P(B/A)P(A)$

Independent Events : $P(A\cap B)=P(A)P(B)$

$$P(X=x)={}^nC_x p^x q^{n-x} \quad , \quad x=0,1,2,3,...,n$$

$$P(X=x)=\frac{\lambda^x e^{-\lambda}}{x!} \quad , \quad x=0,1,2,3,...$$